

REPORT DOCUMENTATION PAGE

AFRL-SR-AR-TR-02-

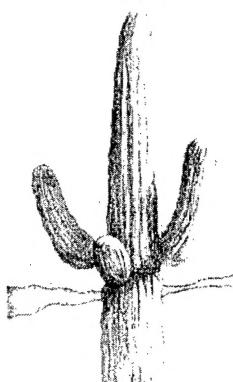
es,
his
on

Public reporting burden for this collection of information is estimated to average 1 hour per response, including gathering and maintaining the data needed, and completing and reviewing the collection of information. Send collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project 0704-0188.

1. AGENCY USE ONLY (Leave blank)			2. REPORT DATE	3. REPORT NUMBER
			2 Aug 2002	FINAL REPORT 01 JUN 01 TO 28 FEB 02
4. TITLE AND SUBTITLE			5. FUNDING NUMBERS	
INTERNATIONAL CONFERENCE ON ORGANIC NONLINEAR OPTICS VI			F49620-01-1-0400 2303/CV 61102F	
6. AUTHOR(S)			8. PERFORMING ORGANIZATION REPORT NUMBER	
DR SEITH R. MARDER				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
UNIVERSITY OF ARIZONA DEPT OF CHEMISTRY AND OPTICAL SCIENCES 1306 E. UNIVERSITY BLVD. TUCSON, AZ 85721				
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			12a. DISTRIBUTION AVAILABILITY STATEMENT	
AFOSR/NL 801 N. RANDOLPH STREET, ROOM 732 ARLINGTON VA 22203-1977			APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.	
11. SUPPLEMENTARY NOTES			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)			<p>20020909 112</p>	
This proposal was to provide partial funding for an international conference on the topic of organic nonlinear optics with meeting headquarters in Tucson, Arizona. The purpose of the meeting was to bring together top researchers - whose expertise spans material design, material characterization, device fabrication, and integrated device architectures - to the captive setting of a small town to discuss and assess progress in the field. This conference was motivated by six previous conferences that were held in Pullman, Washington in the summer of 1992, in Val Thorens, France in the winter of 1994 (ICONO'1); in Kusatsu, Japan in the summer of 1995 (ICONO'2); on Marco Island in the winter of 1996 (ICONO'3); Chitose, Japan summer of 1998 (ICONO'4) and Davos in Switzerland in spring of 2000 (ICONO's). This proposed meeting would be the seventh in the series of meetings that are held every 18 months. The demand for such a meeting has been evident by full-capacity attendance at all previous ICONO meetings. At the ICONO'1 meeting, U.S. and other non-European attendees had the opportunity to learn about a large array of European research activities that are normally not represented at U.S. conferences. Similarly, at ICONO'2, Pacific Rim research was showcased. ICONO'3, while held in the U.S. , was attended by a majority of foreign scientists. ICONO'4 gave U.S. participants a first-hand view of a new university that was built in photonics valley in Japan. ICONO'6 brought together a group of internationally distinguished researchers to a forum in Tucson that encouraged discussion and interactions.				
14. SUBJECT TERMS			15. NUMBER OF PAGES	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT	
UNCLAS	UNCLAS	UNCLAS		

INTERNATIONAL CONFERENCE ON ORGANIC NONLINEAR OPTICS VI

This proposal was to provide partial funding for an international conference on the topic of organic nonlinear optics with meeting headquarters in Tucson, Arizona. The purpose of the meeting was to bring together top researchers - whose expertise spans material design, material characterization, device fabrication, and integrated device architectures - to the captive setting of a small town to discuss and assess progress in the field. This conference was motivated by six previous conferences that were held in Pullman, Washington in the summer of 1992; in Val Thorens, France in the winter of 1994 (ICONO'1); in Kusatsu, Japan in the summer of 1995 (ICONO'2); on Marco Island in the winter of 1996 (ICONO'3); Chitose, Japan summer of 1998 (ICONO'4) and Davos in Switzerland in spring of 2000 (ICONO'5). This proposed meeting would be the seventh in the series of meetings that are held every 18 months. The demand for such a meeting has been evident by full-capacity attendance at all previous ICONO meetings. The meeting had numerous attendees from countries that are active in organic nonlinear optics. At the ICONO'1 meeting, U.S. and other non-European attendees had the opportunity to learn about a large array of European research activities that are normally not represented at U.S. conferences. Similarly, at ICONO'2, Pacific Rim research was showcased. ICONO'3, while held in the U.S., was attended by a majority of foreign scientists. ICONO'4 gave U.S. participants a first-hand view of a new university that was built in photonics valley in Japan. ICONO'6 brought together a group of internationally distinguished researchers to a forum in Tucson that encouraged discussion and interactions.



INTRODUCTION

History

Over the past fifteen years, organic nonlinear-optical materials have been the center of intense research aimed at providing the basis for developing a variety of optical devices.[1, 2] Owing to the large second-order response of organic crystals, for example, many workers have addressed the problem of growing large high-quality crystals for second harmonic generation applications.[3] Poled doped polymers, on the other hand, were demonstrated to combine the large second-order nonlinearity of the dopant dye molecules with the optical quality of the polymer.[4] Much progress has been made in making highly stable poled polymeric materials.[5-11] Basic studies to shed light on the relaxation mechanisms in polymers aimed at further improving material stability and reliability have seen recent advances [12-17] and new methods of poling such as photoassisted-poling [18, 19] and all-optical poling [20, 21] are being reported regularly.

More recently, work has been centered not only on improving the nonlinear-optical response of molecules, [22-24] but also on improving their thermal stability. There were concerns that high nonlinearity molecules are also less stable, [25, 26] but new chromophores of high nonlinearity and thermal stability have been developed.[27] Such chromophores have been covalently attached to polymers or doped into highly stable polymers to enhance their orientational stability.[28, 29] Poled polymers are thus getting closer to becoming a technologically important nonlinear-optical material.

One advantage of the polymeric materials is that they are easy to process into large-area thin films. The first demonstration of a device incorporating a poled polymer as the nonlinear material was reported in 1987. [30] Later, a poled polymer Mach-Zehnder guided-wave electro-optic modulator was shown to have an operational bandwidth up to at least 20GHz.[31] More recently, bandwidths of 40GHz [32, 33] and 60GHz [34] have been demonstrated. The high bandwidth confirms the polymeric material's potential for high-speed operation. Poled polymers are also finding applications as second harmonic generators. A periodically poled polymer film waveguide that can be quasi-phase-matched for high efficiency has already been demonstrated.[35] Yet another method for achieving high efficiency second harmonic generation is through anomalous dispersion, where the dye chromophore acts as both the source of nonlinear response and as the source of dispersion in the refractive index. This phenomena was observed in a specially designed dye chromophore.[36]

A large third-order response in a doped polymer as measured with third harmonic generation was first reported by Matsumoto and coworkers.[37] Later, these results were confirmed by other workers who extended the nonlinear-optical characterization studies to a variety of chromophore dopants to build a theoretical framework for designing molecules with a large third-order nonlinear-optical response.[38-41] The all-optical switching nonlinearity of a polymer waveguide has been reported, [42] while other workers have addressed the optimization of other material properties such as decreased absorptive loss and two-photon absorption - important for all-optical device design.[43] Waveguiding polymer-optical fibers with nonlinear-optical cores have recently been designed specifically to meet the criteria of all-optical logic and switching devices.[44] All-optical switching has recently been observed in a polymer optical fiber with a squaraine-doped core.[45]

Studies of the third-order nonlinear-optical response of dye chromophores has accelerated. Theoretical work by Marder and coworkers on the origin of the third-order response has lead to the development of better molecules.[46] Separately, the class of squaraine dyes have received considerable attention due to their promise as chromophores that will be used in all-optical devices and are probably now the best understood $X^{(3)}$ Molecules.[47-49]

Another interesting material class is conjugated polymers. One such crystalline material, polydiacetylene-pTS (PTS), has received much attention owing to its large third-order nonlinear-optical response. Thakur and Meyler developed a shear-growing method for making thin crystal platelets of PTS.[50] Such thin film samples were studied with femtosecond transient absorption measurements that determined the nonlinearity to arise from a singlet exciton.[51, 52] More significantly for practical devices, it was shown that these materials could be formed into $8\mu\text{m}$ wide, $2.5\mu\text{m}$ thick strip waveguides.[53]

Polymeric materials are finding new areas of application. The material design flexibility afforded to doped polymers makes them attractive in a large variety of devices and applications. As a case in point, the large second-order nonlinearity and photosensitivity that is required of a photorefractive material was intentionally imparted to a polymer by incorporating two distinct dopants. The photorefractive effect of grating formation was observed according to prediction.[54] By applying the understanding that molecular orientation enhances the photorefractive effect,[55] in just three years after the initial observation of the photorefractive effect in a polymer, these materials have been optimized for nearly 100% diffraction efficiency and coupling gain coefficients of more than $2\text{cm}^{-1}/\mu\text{m}$.[56, 57] Shortly thereafter a functionalized polymer exhibiting all the requisite

properties for the photorefractive effect was demonstrated.[58] Other significant progress includes the demonstration of a photorefractive polymeric material containing C₆₀ that has an exceptionally long dark lifetime, [59] the demonstration of time-averaged interferometry,[60] and the demonstration of an optical correlator.[61]

It is significant to point out that materials of high photorefractive figure of merit offer the possibility of volume optical data storage and real time holography, areas that will be technologically important in the near future as optical memory becomes common. Therefore, accelerating the possibility that optical memory may replace magnetic media. The great volume of work in this area attests to its technological significance.

Many new applications for polymers have emerged over the last 5-10 years. They are gradually becoming the materials of choice for electroluminescence [62-64] devices, that is, the conversion of electricity to light. Applications include thin-film displays. Because polymers are flexible and can be formed into large sheets, they can be used in roll-up displays and large area computer displays. Graded index, polymer optical fibers, on the other hand, are positioned to become the standard for local area networks due to their low cost, simplicity of connector design, and high bandwidth per unit length.[65-67] Note that a special two-issue set of the *Journal of the Optical Society of America*, published in January and February 1998, surveys the activity in the field.[68] These issues, which contain four dozen peer-reviewed articles, are based on ICONO'3 and cites the supporting agencies. The last such special issue appeared a decade before.

The field of organic nonlinear optics has also moved into new and unexpected areas. Most recently, researchers are applying more sophisticated methods of spectroscopy and time resolved studies to better understand how the nature of the excited states of a molecule affects the resulting nonlinearity. There has also been a resurgence in the study of squaraine molecules due to their large nonlinearities and negative off-resonant susceptibility.[69, 70] A full understanding of these materials is still elusive. Many nonlinear-optical measurements and calculations on classic polymers as well as newly synthesized materials also have been reported. In addition, rare-earth-doped polymers are being studied for use as amplifiers.[71, 72]

Another more mature area - polymer waveguides and devices - continues to progress. New polymer fiber devices and characterization techniques have been reported. In particular, the first demonstration of electrooptic fiber was reported - making all sorts of second-order devices now possible.[73, 74] Novel refractive index and nonlinear loss techniques were also recently

reported.[75] As the linear-optical properties find applications as passive devices, active device needs are sure to follow. New areas include optical squeezing in organics [76] and nonlinear-optical imaging of electric fields, [77] that has applications in integrated circuit testing.

From the brief survey presented above, it is clear that much progress has been made in developing organic materials. Furthermore, the high degree of flexibility in both engineering molecules for a specific response and in material processing has lead the way towards building a variety of new devices. As in any highly interdisciplinary field, it is important that workers be in continual communication with each other. Material scientists, for example, need to relay information to device designers on progress in new material development and processing while device scientists need to communicate what material properties are required for specific device designs. To that end, the purpose of the proposed meeting is to bring together workers with a broad range of interdisciplinary experience to discuss new results, to foster exchange of information between the represented disciplines, and to define future directions of promising areas of concentration.

References

- [1] see, for example, "Nonlinear Optical Effects in Organic Polymers," NATO ASI Series, Series E: Applied Sciences – vol 162, J. Messier, F. Kajzar, P. Prasad, and D. Ulrich, eds., Kluwer Academic Publishers, Dordrecht, 1989.
- [2] see, for example, "Materials for Nonlinear Optics: Chemical Perspectives," - American Chemical Society, ACS Symposium Series, vol 455, S.R. Marder, J.E. Sohn, and G.D. Stucky, eds., ACS Washington, D.C. (1991).
- [3] see, for example, D. F. Eaton, *Science* **253**, 281 (1991).
- [4] K. D. Singer, J. E. Sohn, S. J. Lalama, *Appl. Phys. Lett.* **49**, 248 (1986).
- [5] K. D. Singer, M. G. Kuzyk, W. R. Holland, J. E. Sohn, S. J. Lalama, R. B. Comizzoli, H. E. Katz, and M. L. Schilling, *Appl. Phys. Lett.* **53**, 1800 (1988).
- [6] H. L. Hampsch, J. Yang, G. K. Wong, and J. M. Torkelson, *Polym. Comm.* **30**, 40 (1989).
- [7] H. L. Hampsch, J. Yang, G. K. Wong, and J. M. Torkelson, *Macromolecules* **23**, 3640 (1990).
- [8] H. L. Hampsch, J. Yang, G. K. Wong, and J. M. Torkelson, *Macromolecules* **23**, 3648 (1990).
- [9] M. Eich, A. Sen, H. Looser, G. C. Bjorklund, J. D. Swalen, R. Twieg, and D. Y. Yoon, *J. Appl. Phys.* **66**, 2559 (1989).
- [10] M. Eich, B. Reck, D. Y. Yoon, C. G. Wilson, and G. C. Bjorklund, *J. Appl. Phys.* **66**, 3241 (1989).
- [11] J. W. Wu, J. F. Valley, S. Ermer, E. S. Binkley, J. T. Kenney, G. F. Lipscomb, and R. Lytel, *Appl. Phys. Lett.* **58**, 225 (1991).
- [12] W. Kohler, D. R. Robello, P. T. Dao, C. S. Willand, and D. J. Williams, *J. Chem. Phys.* **93**, 9157 (1990).
- [13] K. D. Singer and L. A. King, *J. Appl. Phys.* **70**, 3251 (1991).
- [14] J. A. Cline and W. N. Herman, *Organic Thin Films for Photonics Applications*, 1995 OSA Technical Digest Series **21**, Paper MD39, 206 (1995).
- [15] S. C. Brower and L. M. Hayden, *Appl. Phys. Lett.* **63**, 2059 (1993).
- [16] Q. Tran-Cong, S. Chikaki, and H. Kanato, *Polymer* **35**, 4465 (1994).
- [17] Dhinojwala, G. K. Wong, and J. M. Torkelson, *J. Chem. Phys.* **100**, 6046 (1994).

- [18] Z. Sekkat and W. Knoll, *J. Opt. Soc. Am. B* **12**, 1855 (1995).
- [19] P. M. Blanchard and G. R. Mitchell, *Appl. Phys. Lett.* **63**, 2038 (1993).
- [20] Fiorini, F. Charra, and J. M. Nunzi, *J. Opt. Soc. Am. B* **11**, 2347 (1994).
- [21] J. M. Nunzi, J. M., F. Charra, C. Fiorini, and J. Zyss, *Chem. Phys. Lett.* **219**, 349 (1994).
- [22] S. R. Marder, C. B. Gorman, B. G. Tiemann, and L. T. Cheng, *J. Am. Chem. Soc.* **115**, 3006 (1993).
- [23] L. T. Cheng, W. Tam, S. R. Marder, A. E. Stiegman, G. Rikken, and C. W. Spangler, *J. Phys. Chem.* **95**, 10631 (1991)
- [24] A. K.-Y. Jen, V. P. Rao, K. Y. Wong, and K. J. Drost, *J. Chem. Soc. Chem. Commun.* **90** (1993).
- [25] R. Moylan, R. J. Twieg, V. Y. Lee, S. A. Swanson, K. M. Betterson, and D. R. Miller, *J. Am. Chem. Soc.* **115**, 12599 (1993).
- [26] R. F. Shi, M. H. Wu, S. Yamada, Y. Cai, and A. F. Garito, *Appl. Phys. Lett.* **63**, 1173 (1993).
- [27] A. K.-Y. Jen, Y. Q. Liu, L. X. Zheng, S. Liu, K. J. Drost, Y. Zhang, and L. R. Dalton, *Adv. Mater.* **11**, 452 (1999).
- [28] J. Wu, J. F. Valley, S. Ermer, E. S. Binkley, J. T. Kenney, G. F. Lipscomb, and R. Lytel, *Appl. Phys. Lett.* **58**, 225 (1991).
- [29] K. J. Drost, V. P. Rao, and A. K.-Y. Jen, *J. Chem. Soc. Chem. Commun.* **50**, (1994).
- [30] J. Thackara, M. Stiller, G. F. Lipscomb, R. Lytel, and E. Okazaki, Conference on Lasers and Electrooptics, Proceedings, p260, paper THK29, (1987); J. I. Thackara, G. F. Lipscomb, M. A. Stiller, A. J. Ticknor, and R. Lytel, *Appl. Phys. Lett.* **52**, 1031 (1988).
- [31] G. Girton, S. L. Kwiatkowski, G. F. Lipscomb, and R. S. Lytel, *Appl. Phys. Lett.* **58**, 1730 (1991).
- [32] C. Teng, *Appl. Phys. Lett.* **60**, 1538 (1992).
- [33] W. Wang, D. Chen, H. R. Fetterman, Y. Shi, W. H. Steier and L. R. Dalton, *IEEE Photon. Technol. Lett.* **11**, 54 (1999).
- [34] W. Wang, D. Chen, H. R. Fetterman, Y. Shi, J. H. Bechtel, S. Kalluri, W. H. Steier and L. R. Dalton, *Organic Thin Films for Photonics Applications*, 1995 OSA Technical Digest Series **21**, Paper WA4-1, 293 (1995).

[35] G. Khanarian, R. A. Norwood, D. Haas, B. Feuer, and D. Karim, *Appl. Phys. Lett.* **57**, 977 (1990).

[36] P. A. Cahill, K. D. Singer, and L. A. King, *Opt. Lett.* **14**, 601 (1989).

[37] S. Matsumoto, K. Kubodera, T. Kurihara, and T. Kaino, *Appl. Phys. Lett.* **54**, 1630 (1987).

[38] M. G. Kuzyk and C. W. Dirk, *Appl. Phys. Lett.* **54**, 1628 (1989).

[39] M. G. Kuzyk, C. W. Dirk, and J. E. Sohn, *J. Opt. Soc. Am. B* **5**, 842 (1990).

[40] M. G. Kuzyk and C. W. Dirk, *Phys. Rev. A* **41**, 5098 (1990).

[41] W. Dirk and M. G. Kuzyk, *Chem. of Mater.* **2**, 5 (1990).

[42] M. C. Gabriel, N. H. Whitaker, Jr., C. W. Dirk, M. G. Kuzyk, and M. Thakur, *Opt. Lett.* **16**, 1334 (1991).

[43] S. Winter, C. A. S. Hill, and A. E. Underhill *Appl. Phys. Lett.* **58**, 107 (1991).

[44] M. G. Kuzyk, U. C. Paek, and C. W. Dirk, *Appl. Phys. Lett.* **59**, 902 (1991).

[45] D. W. Garvey, Q. Li, M. G. Kuzyk, and C. W. Dirk, *Opt. Lett.* **21**, 104 (1996).

[46] S. R. Marder, J. W. Perry, G. Bourhill, C. B. Gorman, B. G. Tiemann, and K. Mansour, *Science* **261**, 186 (1993).

[47] Y. Z. Yu, R. F. Shi, A. F. Garito, and C. H. Grossman, *Opt. Lett.* **19**, 786 (1994).

[48] J. H. Andrews, J. D. V. Khaydarov, and K. D. Singer, *Opt. Lett.* **19**, 984 (1994).

[49] Q. L. Zhou, R. F. Shi, O. Zamani-Khamiri, and A. F. Garito, *Nonlinear Opt.* **6**, 145 (1993).

[50] M. Thakur and S. Meyler, *Macromolecules* **18**, 2341 (1985).

[51] I. Greene, J. Orenstein, R. R. Millard, and L. R. Williams, *Phys. Rev. Lett.* **58**, 2750 (1987).

[52] B. I. Greene, J. Orenstein, R. R. Millard, and L. R. Williams, *Chem. Phys. Lett.* **139**, 381 (1987).

[53] M. Thakur, B. Verbeek, G. C. Chi, and K. J. O'Brien, "Nonlinear Optical Properties of Polymers" in *MRS Symposium Proceedings* **109**, 41 (1988).

[54] S. Ducharme, J. C. Scott, R. J. Twieg, and W. E. Moerner, *Phys. Rev. Lett.* **66**, 1846 (1991).

[55] W. E. Moerner, S. M. Silence, F. Hache, and G. C. Bjorklund, *J. Opt. Soc. Am. B* **11**, 320 (1994).

[56] K. Meerholz, B. Volodin, Sandalphon, B. Kippelen, and N. Peyghambarian, *Nature* **371**, 497 (1994).

[57] M. E. Orczyk, J. Sieba, P. N. Prasad, *Appl. Phys. Lett.* **67**, 311 (1995).

[58] L. Yu, Y. M. Chen, W. K. Chan, *J. Phys. Chem.* **95** 2797 (1995).

[59] S. M. Silence, J. S. Scott, J. J. Stankus, W. E. Moerner, C. R. Moylan, G. C. Bjorklund, R. J. Twieg, *J. Phys. Chem.* **99**, 4096 (1995).

[60] B. L. Volodin, Sandalphon, K. Meerholz, B. Kippelen, N. V. Kukhatarev, N. Peyghambarian, *Optical Engineering* **34** 2213 (1995).

[61] Hapvorson, B. Kraabel, A. J. Heeger, B. L. Volodin, K. Meerholz, Sandalphon , N. Peyghambarian, *Opt. Let.* **20** 76 (1995).

[62] J. Kido, M. Kimura, and K. Nagai, *Science* **267**, 1332 (1995)

[63] Dodabalapur, L. J. Rothberg, T. M. Miller, and E. W. Kwock, *Appl. Phys. Lett.* **64**, 2486 (1994).

[64] Dodabalapur, L. J. Rothberg, and T. M. Miller, *Appl. Phys. Lett.* **65**, 2308 (1994).

[65] T. Kaino, "Polymer Optical Fiber," in *Polymers for Lightwave and Integrated Optics: Technology and Application*, L. A. Hornak, ed. (Marcel Dekker, New York 1992).

[66] Y. Koike, "High Bandwidth Low Loss Polymer Fibers," *Proc. ECOC'92*, p. 679 (1992).

[67] S. Yamazaki et al., "A 2.5 Gb/s 100m GRIN Plastic Optical Fiber Data Link at 650nm Wavelength," *Proc. ECOC'94 Post Deadline Paper*, p. 1 (1994).

[68] "Organic and Polymeric Nonlinear Optical Materials (OPNOM)," M. G. Kuzyk, K. D. Singer, and R. J. Twieg, eds., *J. Opt. Soc. Am B* **15** nos. 1 & 2 (1998).

[69] J. Andrews, K. D. Singer, C. W. Dirk, D. L. Hull, and K. C. Chung, *SPIE Proc* **3473**, 68 (1998).

[70] K. S. Mathis, M. G. Kuzyk, C. W. Dirk, A. Tan, S. Martinez, and G. Gamos, *J. Opt. Soc. Am B* **15**, 871 (1998)

[71] C. Koeppen, S. Yamada, G. Jiang, A. F. Garito, L. R. Dalton, LR "Rare-earth organic complexes for amplification in polymer optical fibers and waveguides," *J. Opt. Soc. Am B* **14**, 155 (1997).

- [72] R. Y. Gao, C. Koeppen, C. Q. Zheng, "Effects of chromophore dissociation on the optical properties of rare-earth-doped polymers," *Appl. Opt.* **37**, 7100 (1998).
- [73] M. G. Kuzyk, D. W. Garvey, S. R. Vigil, et al., "All-optical devices in polymer optical fiber," *Chem. Phys.* **245**, 533 (1999).
- [74] D. J. Welker, J. Tostenuude, D. W. Garvey, and M. G. Kuzyk, "Fabrication and characterization of single-mode electro-optic polymer optical fiber," *Opt. Lett.* **23**, 1826 (1998).
- [75] M. G. Kuzyk, D. W. Garvey, B. K. Canfield, et al., "Characterization of single-mode polymer optical fiber and electrooptic fiber devices," *Chem. Phys.* **245**, 327 (1999).
- [76] T. Goodson, *SPIE Proc* **3473** (1998).
- [77] K. Meyers, W. E. Torruellas, et al., *SPIE Proc* **3473**, 8 (1998).

CONFERENCE TOPICS AND ORGANIZATION

The symposium provided a forum for discussion of recent developments in studies of nonlinear-optical processes in organic and polymeric systems and their applications in photonic technologies. The topics focused on fundamental issues in nonlinear-optical experiments and theory and on novel optical guided-wave devices and architectures.

Specifically, areas of discussion included:

- $\chi^{(2)}$ materials;
- $\chi^{(2)}$ devices;
- $\chi^{(3)}$ materials and devices;
- organic electroluminescent materials and processes;
- photorefractive materials and processes;
- biophotonics;
- multiphoton processes;
- charge transport in organic materials;
- single molecule spectroscopy;
- organic field effect transistors and devices;
- organic lasers;
- polymer optical fibers;
- optical limiting materials;
- nanophotonics.

The meeting was held December 16-20, 2001 in Tucson, Arizona at the Loews Ventana Canyon Resort.

Meeting Format

The format consisted of oral presentations in single sessions on interrelated topics and two poster sessions. Several blocks of free time were scheduled to encourage scientific discussions. A distinguished group of U.S. and international speakers from academic, government and industrial laboratories were invited to the meeting as shown in the attached meeting schedule. All information about the meeting was posted on the official ICONO website: www.ICONO6.arizona.edu.

Organizers

Conference Chair:

Seth Marder, Professor of Chemistry and Optical Sciences
University of Arizona, 9030 S. Rita Road, Suite 300, Tucson, AZ 85747
Email: smarder@u.arizona.edu
Phone: 520-574-0456 ext. 13
Fax: 520-574-7810

Conference Co-chairs:

Hiroyuki Sasabe, Mark Kuzyk, François Kajzar

Local Organizing Committee:

Jean-Luc Brédas, Larry Dalton, Bernard Kippelen, André Persoons, Joseph Perry,
Nasser Peyghambarian

International Advisory Committee:

Zhenan Bao, Christoph Bubeck, Anthony Garito, Peter Günter, Alan Heeger,
Charles Lee, Hiro Nakanishi, Paul Armistead, Paras Prasad, Kenneth Singer,
Robert Twieg, Eric Van Stryland, Joseph Zysse

Impact

The interdisciplinary interactions and exchanges between internationally renowned leaders in the field provided perspectives that can be brought to bear on developing a nonlinear-optics-based technology. As was the case with the heavily attended ICONO'1, ICONO'2, ICONO'3, ICONO'4, and ICONO'5 meetings, cross-fertilization between Japanese, European, and North American researchers occurred at ICONO'6. Furthermore, because this conference attracted a large international group, this will give us the opportunity to better assess the status of our foreign competitors.

There were 142 attendees: 10 session chairs, 35 speakers, 78 posters, and 20 volunteers. Attendees included scientists from Belgium (10), Canada (4), France (3), Germany (5), Italy (6), Japan (16), Korea (7), Mexico (1), New Zealand (2), Switzerland (2), United Kingdom (1) and the United States.

Publication

Invited speakers were invited to submit papers for inclusion of a special issue of *Advanced Functional Materials*, that was guest edited by Jean-Luc Brédas and Seth R. Marder. The issue includes the papers by the following lead authors:

- Bernard Kippelen
- David Beljonne
- Toshiyuki Watanabe
- Wolfgang Knoll
- Toshi Kaino
- WE Moerner
- Valy Susan
- Susan Ermer
- Koen Clays
- Alex Jen

Sponsors

The Organizing Committee sought and obtained financial support from a variety of federal, state corporate and private entities.

Sponsors (in alphabetical order)

Air Force Office of Scientific Research
Brewer Science, Inc. Rolla, MO
Cambridge Display Technology, Cambridge, UK
Defense Advanced Research Projects Agency
DuPont, Wilmington, DE
Lockheed-Martin, Corp., Los Altos, CA
Lucent Technologies, Murray Hill, NJ
Lumera, Bothell, WA
National Science Foundation
Nitto Denko, Oceanside, CA
NP Photonics, Tucson, AZ
Office of Naval Research
Research Corporation, Tucson, AZ
Spectra Physics, Mountain View, CA
State of Arizona, Prop 301 Funds
Sun Microsystems. Palo Alto, CA
Uniax Corporation, Goleta, CA
University of Arizona, College of Science
University of Arizona, Office of Economic Development
University of Arizona, Optical Sciences Center
University of Arizona, Vice President for Research

Monday, December 17, 2001

8:15 – 8:30	Opening Remarks	<i>Chair: S. Marder</i>
8:30 – 10:10	EO Materials & Devices I	<i>Session Chair: C. Lee</i>
8:30 – 9:00	Functional Dendrimers for Nonlinear Optics <i>Alex K.Y. Jen, Invited Speaker</i>	
9:00 – 9:20	π -Control of Intramolecular Charge Transfer in Azinium-Dicyanomethine Zwitterions <i>Giorgio A. Pagani, Contributed Talk</i>	
9:20 – 9:50	Progress in Polymeric Materials and Devices for Electro-Optic Modulation <i>Susan Ermer, Invited Speaker</i>	
9:50 – 10:10	Dynamics of Diffraction Grating Formation in Hybrid: Photoconducting Polymer – Liquid Crystal Cells <i>François Kajzar, Contributed Talk</i>	
10:10 – 10:40	Break	
10:40 – 12:00	Photo-Refractives	<i>Session Chair: H. Sasabe</i>
10:40 – 11:10	Recent Advances in Understanding and Development of Photorefractive Polymers and Glasses <i>W. E. Moerner, Invited Speaker</i>	
11:10 – 11:40	Photorefractive Polymers with Non-destructive Read-out <i>Bernard Kippelen, Invited Speaker</i>	
11:40 – 12:00	Modeling and Design of Photorefractive Polymer Composites <i>Kenneth D. Singer, Contributed Talk</i>	
12:00 – 4:30	Free Time	
4:30 – 6:20	Studies of Conjugated Materials I	<i>Session Chair: J.-L. Brédas</i>
4:30 – 5:00	Neutral and Charged Photoexcitations in Films of Regio-Regular and Regio-Random Poly(3 hexyl thiophene) <i>Z. Val Vardeny, Invited Speaker</i>	
5:00 – 5:20	Two Photon Photopolymerization of Functional Micro-Devices <i>Satoshi Kawata, Contributed Talk</i>	
5:20 – 5:40	Injection Efficiency Enhancement in Organic Electroluminescent Structures <i>Ted Sargent, Contributed Talk</i>	
5:40 – 6:00	Ultra-fast Optical Properties in Dendrimer and Dendrimer Metal Nanocomposites <i>Theodore Goodson III, Contributed Talk</i>	
6:00 – 6:20	Studies of Amplified Spontaneous Emission in Dye-Doped Polymer Fibers at 650 nm <i>Mark G. Kuzyk, Contributed Talk</i>	
6:20 – 7:30	Poster Session I – listing follows	

Tuesday, December 18, 2001

8:30 – 10:00 **EO Materials & Devices II** *Session Chair: G. Stegeman*

8:30 – 9:00 Novel Developments in Multipolar Molecular Engineering: Application to Optical Signal Processing and High Bit-Rate Telecommunications
Isabelle Ledoux, Invited Speaker

9:00 – 9:30 All Optical Refractive Index Control Using Photochromic Polymer
Eunkyoung Kim, Invited Speaker

9:30 – 10:00 Optical and Molecular Technologies in Modern Computer Systems
Rick Lytel, Invited Speaker

10:00 – 10:30 Break

10:30 – 12:20 **Studies of Conjugated Materials II** *Session Chair: J. Perry*

10:30 – 11:00 Nonlinear Spectroscopy for Optical Limiter Development
Eric Van Stryland, Invited Speaker

11:00 – 11:30 Three Dimensional Microfabrication of Soft Materials by Two-Photon Excitation
Toshiyuki Watanabe, Invited Speaker

11:30 – 11:50 Optical Orientation of Individual Isomers
Zonheir Sekkat, Contributed Talk

12:30 – 4:30 Excursion – Arizona Sonora Desert Museum

5:30 – 7:00 Poster Session II

7:15 – 11:00 Excursion – Pinnacle Peak Restaurant

Wednesday, December 19, 2001

8:30 – 10:10 Nano & Bio-Photonics I *Session Chair: B. Kippelen*

8:30 – 9:00 Nanophotonics
Watt W. Webb, Invited Speaker

9:00 – 9:20 Molecular Probes for Nonlinear Optical Imaging of Biological Membranes
Mireille Blanchard-Desce, Contributed Talk

9:20 – 9:40 New Organic Dendrimers with Record Intrinsic Two-Photon Absorption
Charles W. Spangler, Contributed Talk

9:40 – 10:10 Nonlinear Light Scattering by Organic Molecules and Materials
Koen Clays, Invited Speaker

10:10 – 10:40 Break

10:40 – 12:20	EO Materials & Devices II	<i>Session Chair: N. Peyghambarian</i>
10:40 – 11:10	Two-Photon Absorption of Conjugated Materials: Role of Symmetry and Dimensionality <i>David Beljonne, Invited Speaker</i>	
11:10 – 11:40	<i>Fabrication of DAST Channel Optical Waveguides</i>	
	<i>Toshikuni Kaino, Invited Speaker</i>	
11:40 – 12:10	Molecular Beam Deposition of Organic Nonlinear Optical Thin Films <i>Peter Günter, Invited Speaker</i>	
12:15 – 4:30	Free Time	
4:30 – 6:10	Organic Electronics I	<i>Session Chair: N. Armstrong</i>
4:30 – 5:00	Charge Transport Properties of Amorphous Molecular Materials for Organic Light-Emitting Diodes <i>Yasuhiko Shirota, Invited Speaker</i>	
5:00 – 5:20	Liquid Crystalline and Hybrid Organic Semiconductors <i>Robert J. Twieg, Contributed Talk</i>	
5:20 – 5:40	Ultrafast Charge Transport in Self-Assembling Photofunctional Molecular Arrays <i>Michael R. Wasielewski, Contributed Talk</i>	
5:40 – 6:10	Three Dimensional Microfabrication of Soft Materials by Two-Photon Excitation <i>Francesco Stellacci, Invited Talk</i>	
6:10 – 7:00	Free time	
7:00 – 7:50	Pre-banquet Reception	
8:00 – 1030	Conference Banquet	

Thursday, December 20, 2001

8:30 – 10:10	Nano & Bio-Photonics II	<i>Session Chair: A. Persoons</i>
8:30 – 9:00	Surface-Plasmon Optical Techniques for the Quantitative Evaluation of Oligonucleotide Hybridization Reactions at Solid/Solution Interfaces <i>Wolfgang Knoll, Invited Speaker</i>	
9:00 – 9:30	Photorefractive Organic Glasses <i>Rüdiger Wortmann, Invited Speaker</i>	
9:30 – 9:50	Real Time Vibrational Dynamics in Conjugated Systems <i>Guglielmo Lanzani, Contributed Talk</i>	
9:50 – 10:10	Polymer Photonic Crystal Slab Waveguides <i>Markus Schmidt, Contributed Talk</i>	
10:10 – 10:40	Break	

10:40 – 12:00 **Organic Electronics II**

Session Chair: P. Armistead

10:40 – 11:10 Self-Assembled Organic Materials for Organic Transistors
Zhenan Bao, Invited Speaker

11:10 – 11:40 Spintronics in Hybrid Organics – Inorganic Devices
Carlo Taliani, Invited Speaker

11:40 – Closing Remarks *Chair: S. Marder*

Poster Session – Monday, December 17, 2001

PS 24 New Heterocycle-Based Dyes for Efficient Two Photon Absorption
R. Signorini

PS 25 Time-Resolved Transmission through a Photonic Crystal in the Complete Fourier Domain
K. Wostyn

PS 26 Alignment of Liquid Crystals with Periodic Nanostructures Ablated in Polymeric Surfaces
S. Soria

PS 27 Photoinduced Birefringence and Optical Activity in Azobenzene-containing Polymer Films
D. Pedron

PS 28 Novel Passive and Active Perfluorocyclobutane(PFCB) Polymers for Photonic Devices
H. Ma

PS 29 A Numerical Study of Solitary Waves in Polymer Optical Fiber Amplifiers
R. J. Kruhlak

PS 30 Theoretical Investigation of the Geometrical and Optical Characteristics of Neutral and Doped Fluorene Oligomers
L.F. Murga

PS 31 Efficient Two Photon Photoacids
W. Zhou

PS 32 Organic Semiconductors: A Theoretical Characterization of the Basic Parameters Governing Charge Transport
D. A. Filho

PS 33 Intramolecular Electron Transfer in Triarylamine Mixed-Valence Systems
V. Coropceanu

PS 34 Reorganization Energy of Oligoacenes
M. Malagoli

PS 35 Dipole Field Effects on Bulk and Surface Optical Properties in Crystals of *para*-nitroaniline
M. Malagoli

PS 36 Controlling Resolution in Three-Dimensional Lithographic Microfabrication by Two-Photon-Initiated Polymerization
S. M. Kuebler

PS 37 Photochemically Induced Growth of Nanoparticles for 2 & 3D Metal Patterning
F. Stellacci

PS 38 Electronic Structure of Organic Charge Transport Materials: Dioxaborines and Oxadiazoles
C. M. Risko

Poster Session II Tuesday, December 18, 2001

PS 1	Metal/conjugated Molecules Interfaces: A Strategy for Enhancing Molecular Nonlinear Optical Properties. A SERS Study <i>M. Del Zoppo</i>	unable to attend
PS 2	Influence of In-Backbone Substitution on Third-Order Nonlinear Optical Properties <i>S. Concilio</i>	unable to attend
PS 3	Polymeric Grating Waveguide for Nonlinear Optical Switching <i>M. A. Bader</i>	
PS 4	THG Properties of Oriented Thin Films of Cobaltadithiolene Complexes <i>T. Kamata</i>	
PS 5	Third Order Nonlinear Optical Susceptibility of Polymers Based on Carbazole Derivatives and New Octupolar Molecules <i>I. Fuks</i>	unable to attend
PS 6	Third-Order Optical Non-Linearities in Titanium Bis-Phthalocyanine/Toluene Solutions <i>Gentilina Rossi</i>	unable to attend
PS 7	Study of Self-Focusing in Thermochromic Polymer New Diffraction Limit <i>Bum Ku Rhee</i>	

PS 32 *T. V. Timofeeva*
Carbazole, Indole and Benzothiophene Derivatives as Potential Materials for NLO LB-films
V. N. Nesterov

PS 33 Arylidene Derivatives of Diaminomaleonitrile: Synthesis and Structures of New Acentric NLO Compounds
V. V. Nesterov, Jr.

PS 34 Chiral (S)-(+)-2-(Methoxymethyl)pyrrolidine Polar Derivatives for NLO Materials
V. V. Nesterov, Jr.

PS 35 Förster Energy Transfer from a Fluorescent Dye to a Phosphorescent Dopant: A Concentration and Intensity Study
B. Domercq

PS 36 Two-Photon Spectroscopy of Cyano-Substituted Bis(styryl)benzene Compounds
Stephanie J. K. Pond

PS 37 Side-Induced Fluorescence Loss Measurements on Laser-Dye Doped and Undoped Unclad Plastic Optical Fibers
C. W. Dirk

PS 38 Self-Organizing Rod-Like Molecular Assemblies: Control of Coherence through Interface Modification and Side-Chain Photolysis
N. Armstrong

Budget

The requested support for five speakers from the United States was used to defray costs for travel registration and hotel fees

Support from Air Force Office of Scientific Research was clearly give in conference.

TOTAL BREAKDOWN

Number	Category	Cost
5	Speakers and attendees	\$6,250
	TOTAL REQUEST	\$6,250

Attendees of ICONO'6 – Tucson, AZ December 2001

<p>Zesheng An University of Arizona PO Box 210041 Tucson, AZ 85721 Phone: 520-621-6342 Fax: 520-574-7810 zeshenga@u.arizona.edu</p>	<p>Jean-Marie Andre University of Namur 61 Rue De Bruxelles 5000 Namur, Belgium Phone: +32-81-724553 Fax: +32-81-724567 jean-marie.andre@fundp.ac.be</p>
<p>J. Paul Armistead Office of Naval Research 800 North Quincy Arlington, VA 22217 Phone: 703-696-4315 Fax: armistj@onr.navy.mil</p>	<p>Neal Armstrong University of Arizona Chemistry Department, GS 839 Tucson, AZ 85721 Phone: 520-621-8242 Fax: nra@u.arizona.edu</p>
<p>Mark Bader Laser Laboratorium Goettingen e.V. Hans-Adolf-Krebs-Weg 1 37077 Goettingen, Germany Phone: +49-551-503543 Fax: +49-551-503532 mbader@llg.gwdg.de</p>	<p>Zhenan Bao Bell Laboratories - Lucent Technologies 600 Mountain Ave., Room 1A-261 Murray Hill, NJ 07974 Phone: 908-582-4716 Fax: 908-582-4868 zbao@lucent.com</p>
<p>Steve Barlow University of Arizona PO Box 210041 Tucson, AZ 85721 Phone: 520-574-0456 Fax: 520-574-7810 sbarlow@email.arizona.edu</p>	<p>Crissie Bauer University of Arizona 9030 S. Rita Rd., Ste. 300 Tucson, AZ 85747 Phone: 520-574-0456 Fax: 520-574-7810 bauerc@u.arizona.edu</p>
<p>Peter Bedworth Lockheed Martin Advanced Technology Center L9-21, Bldg. 204 3251 Hanover St. Palo Alto, CA 94304 Phone: 650-424-2554 Fax: peter.v.bedworth@lmco.com</p>	<p>David Beljonne University of Mons-Hainaut Place du porc, 20 B-7000, Belgium Phone: +32-65-373867 Fax: +32-65-373866 david@averell.umh.ac.be</p>
<p>Eugene Berman KVH Industries, Inc. 8412 185th Street Chicago, IL 60477 Phone: 708-444-3834 Fax: 708-444-2801 eberman@kvh.com</p>	<p>Ivan Biaggio Institute of Quantum Electronics ETH Honggerberg, HPF E 7 CH-8093 Zurich, Switzerland Phone: +41-1-6336559 Fax: +41-1-6331056 biaggio@iqe.phys.ethz.ch</p>

<p>Cliff Bickford Lumera Corporation 19910 North Creek Pkwy, PO Box 3008 Bothell, WA 98011 Phone: 425-398-6532 Fax: 425-398-6599 cliff_bickford@lumera.com</p>	<p>Maximilienne "Max" Bishop University of Arizona PO Box 210041 Tucson, AZ 85721 Phone: 520-574-0456 Fax: 520-574-7810 bishopm@email.arizona.edu</p>
<p>Mircille H. Blanchard-Desce UMR 6510 (Synthèse et Electrosynthèse Organiques) Université de Rennes 1, Campus de Beaulieu, Bât. 10A, 35042 Rennes Cedex Phone: +33-02-23-23-6277 mireille.blanchard-desce@univ-rennes1.fr</p>	<p>Kevin Braun University of Arizona 9030 S. Rita Rd., Ste. 300 Tucson, AZ 85747 Phone: 520-574-0456 x 15 Fax: 520-574-7810 braunk@u.arizona.edu</p>
<p>Jean-Luc Bredas University of Arizona Chemistry Department Tucson, AZ 85721 Phone: 520-626-6561 Fax: jlbredas@u.arizona.edu</p>	<p>Dennis Brown National Reconnaissance Office 14675 Lee Rd. Chantilly, VA 20151-1715 Phone: 703-808-5290 Fax: dbrown@ccf.nrl.navy.mil</p>
<p>Kevin Cammack Nitto Denko Technical 401 Jones Rd. Oceanside, CA 92054 Phone: 760-901-2683 Fax: kevin_cammack@gg.nitto.co.jp</p>	<p>Myoungsik Cha Pusan National University Research Center for Dielectrics Pusan 609-735, Korea Phone: +82-51-510-2957 Fax: 82-51-515-2390 mcha@pnu.edu</p>
<p>Edwin Chandross Bell Laboratories 14 Hunterdon Blvd. Murray Hill, NJ 07974 Phone: 908-464-0415 Fax: eac@pophost.net</p>	<p>Debbie Chester University of Arizona 9030 S. Rita Rd., Ste. 300 Tucson, AZ 85747 Phone: 520-574-0456 x11 Fax: 520-574-7810 dchester@u.arizona.edu</p>
<p>Koen Clays University of Leuven Celestijnenlaan, 200 D Leuven B-3001, Belgium Phone: +32-16-32-7508 Fax: +32-16-32-7982 koen.clays@fys.kuleuven.ac.be</p>	<p>Veaceslav Coropceanu University of Arizona Chemistry Department Tucson, AZ 85721 Phone: 520-626-6514 Fax: coropcea@email.arizona.edu</p>

<p>Gemma D'Ambruoso University of Arizona Chemistry Department PO Box 210041 Tucson, AZ 85721 Phone: 520-621-6342 Fax: gdd@u.arizona.edu</p>	<p>Demetrio da Silva Filho University of Arizona 1604 8th Street Tucson, AZ 85721 Phone: 520-626-6514 Fax: dasf@u.arizona.edu</p>
<p>Carl Dirk University of Texas/El Paso Department of Chemistry El Paso, TX 79968-0513 Phone: 915-747-7560 Fax: 915-747-5748 cdirk@utep.edu</p>	<p>Lisa Dollinger University of Arizona Chemistry Department PO Box 210041 Tucson, AZ 85721 Phone: 520-621-0289 Fax: ldolling@u.arizona.edu</p>
<p>Benoit Domercq University of Arizona Optical Sciences Tucson, AZ 85721 Phone: 520-621-8226 Fax: domerq@optics.arizona.edu</p>	<p>Daniel Dyer Southern Illinois University Department of Chemistry Carbondale, IL 62901-4409 Phone: 618-453-2897 Fax: 618-453-6408 ddyer@chem.siu.edu</p>
<p>Chris Engels K.U. Leuven Celestijnenlaan, 200F Heverlee 3001, Belgium Phone: +32-016-32-7425 Fax: +32-016-32-7880 chris.engels@chem.kuleuven.ac.be</p>	<p>Susan Ermer Lockheed Martin Advanced Technology Center 3251 Hanover St. Palo Alto, CA 94304 Phone: 650-424-3131 Fax: 650-354-5795 susan.ermer@lmco.com</p>
<p>Gianluca Farinola Universita Di Bari Via Orabona, 4 Bari 70526, Italy Phone: +38-080-5442016 Fax: +38-080-5442324 farinol@chimica.uniba.it</p>	<p>Theodore Goodson Wayne State University 75 Chemistry, 5101 Cass Ave. Detroit, MI 48202-3489 Phone: 313-577-6918 Fax: 313-577-8822 tgoodson@chem.wayne.edu</p>
<p>Cara Grasso University of Arizona PO Box 210041 Tucson, AZ 85721 Phone: 520-574-0456 Fax: 520-574-7810 cgrasso@u.arizona.edu</p>	<p>Elke Gubbelmans K.U. Leuven Celestijnenlaan, 200 F Heverlee 3001, Belgium Phone: +32-016-32-7425 Fax: +32-016-32-7880 elke.gubbelmans@chem.kuleuven.ac.be</p>

<p>Peter Günter Institute of Quantum Electronics ETH Honggerberg CH-8093 Zurich, Switzerland Phone: +41-1-6337790 Fax: +41-1-6331056 nlo@iqe.phys.ethz.ch</p>	<p>David Haas University of Arizona 2080 W Speedway, Rm. 1119 Tucson, AZ 85721 Phone: Fax:</p>
<p>David Hagan University of Central Florida 4000 Central Florida Blvd. Orlando, FL 32765 Phone: 407-823-6817 Fax: 407-823-6810 dhagan@mail.ucf.edu</p>	<p>James Harris University of Manchester Oxford Road, M139PL Manchester, United Kingdom Phone: +44-161-275-4295 Fax: +44-161-275-4598 j.harris@man.ac.uk</p>
<p>Michael Hayden University of Maryland, Baltimore County 1000 Hilltop Circle Baltimore, MD 21250 Phone: 410-4545-3199 Fax: hayden@umbc.edu</p>	<p>Rick Hreha University of Arizona PO Box 210041 Tucson, AZ 85721 Phone: 520-574-0456 Fax: 520-574-7810 hreha@u.arizona.edu</p>
<p>Kelly Huff University of Arizona 9030 S. Rita Rd., Ste. 300 Tucson, AZ 85747 Phone: 520-574-0456x12 Fax: 520-574-7810 huffk@u.arizona.edu</p>	<p>Jaehoon Hwang Seoul National University Shillim-Dong, Kwanak-gu Seoul, Korea Phone: +82-2-886-7479 Fax: +82-2-886-8331 hwangja2@snu.ac.kr</p>
<p>Takashi Isoshima RIKEN 2-1 Hirosawa, Wako Saitama 351-0198, Japan Phone: +81-48-462-1111 ext. 3456 Fax: +81-48-462-4695 isoshima@photonic.riken.go.jp</p>	<p>Tomo Iwamura Keio University Umegaki Laboratory 3-14-1 Hiyoshi Kohoku-ku Yokohama 223-8522, Japan Phone: 81-45-563-1151 ext 42222 Fax: 81-45-561-8838 iwamura@ume.elec.keio.ac.jp</p>
<p>Alex Jen University of Washington PO Box 352120 Seattle, WA 98198-2120 Phone: 206-543-2626 Fax: 206-543-3100 ajen@u.washington.edu</p>	<p>Leslie Jones University of Arizona Chemistry Department P.O. Box 210041 Tucson, AZ 85721 Phone: 520-621-9982 Fax: lsjones@u.arizona.edu</p>

<p>Toshikuni Kaino Tohoku University 2-1-1 Katanira, Aobo-Ku Sendai 980-8577, Japan Phone: +81-22-217-5668 Fax: +81-22-217-5671 kaino@icrs.tohoku.ac.jp</p>	<p>Francois Kajzar CEA/Saclay F91191 Gif-sur-Yvette, France Phone: +33-0169-08-6810 Fax: +33-0169-08-7679 kajzar@ortolan.cea.fr</p>
<p>Kenji Kamada National Institute of Advanced Industrial Science and Technology 1-8-31 Midorigoaka, Ikeda, Osaka, Japan Phone: +81-727-51-9523 Fax: +81-727-51-9637 k.kamada@aist.go.jp</p>	<p>Krista Karsgaard University of Arizona P.O. Box 210041 Tucson, AZ 85721 Phone: 520-621-8243 Fax: krista@u.arizona.edu</p>
<p>Jun Kawamata Hokkaido University N12 W6, Sapporo 060-0812, Japan Phone: +81-11-706-2867 Fax: +81-11-706-2883 Kawamata@imd.es.hokudai.ac.jp</p>	<p>Satoshi Kawata Osaka University 2-1 Yamadaoka, Suite Osaka 565-0871, Japan Phone: 0081-6-6879-7845 Fax: 0081-6-6879-7876 kawata@ap.eng.osaka-u.ac.jp</p>
<p>Mitsuhiro Kawazu University of Arizona Optical Sciences 1630 E University Blvd. Tucson, AZ 85721 Phone: 520-621-2383 Fax: mkawazu@optics.arizona.edu</p>	<p>Andrew Kay Industrial Research Ltd. PO Box 31-310 Lower Hutt, New Zealand Phone: +64-4-569-0210 Fax: +64-4-569-00-55 a.kay@irl.cri.nz</p>
<p>Eunkyoung Kim Korea Research Institute of Chemical Technology PO Box 107, Yusung Taejeon 305-600, Korea Phone: +82-42-860-7206 Fax: +82-42-861-4151 ekkim@kRICT.re.kr</p>	<p>Nakjoong Kim Hanyang University Seoul, Korea Phone: +82-2-2290-0935 Fax: +82-2-2290-0572 kimnj@hanyang.ac.kr</p>
<p>Bernard Kippelen University of Arizona Tucson, AZ 85721 Phone: 520-621-4341 Fax: 520-626-4221 kippelen@u.arizona.edu</p>	<p>Wolfgang Knoll Institute for Polymer Research PO Box 3148 55021 Mainz, Germany Phone: +49-6131-379-160 Fax: +49-6131-379-360 knoll@mpip-mainz.mpg.de</p>

<p>Guy Koeckelberghs K.U. Leuven Celestijnenlaan, 200 F Heverlee 3001, Belgium Phone: +32-016-32-7422 Fax: +32-016-32-7990 guy.koeckelberghs@chem.kuleuven.ac.be</p>	<p>Robert Kruhlak University of Auckland Auckland, New Zealand Phone: +64-9-373-7599 x 8833 Fax: +64-9-373-7445 rjk@phy.auckland.ac.nz</p>
<p>Steve Kuebler University of Arizona 9030 S. Rita Rd., Ste. 300 Tucson, AZ Phone: 520-574-0456 x 17 Fax: 520-574-7810 kuebler@u.arizona.edu</p>	<p>Mark Kuzyk Washington State University Department of Physics Pullman, WA 99164-2814 Phone: 509-335-4632 Fax: 509-305-7816 mgk@turbonet.com</p>
<p>Guglielmo Lanzani Politecnico Di Milano Piza Leonardo, Davinci 32 Milano 20133, Italy Phone: +39-02-2399-6166 Fax: +39-02-2399-6126</p>	<p>Isabelle Ledoux-Rak Laboratoire de Photonique Quantique et Moleculaire 94235 Cachan, France Phone: +33-147-40-5560 Fax: +33-147-40-5567 isabelle.ledoux@lpqm.ens-cachan.fr</p>
<p>Charles Lee AFOSR 801 N. Randolph St., Ste. 732 Arlington, VA 22203 Phone: 703-696-7779 Fax: charles.lee@afosr.af.mil</p>	<p>Kwang-Sup Lee Hannam University 133 Ojung-Dong, Daedeog-Ku Taejon 306-791, Korea Phone: +82-42-629-7394 Fax: +82-42-626-8841 kslee@mail.hannam.ac.kr</p>
<p>Sheng Li Nitto Denko Technical 401 Jones Rd. Oceanside, CA 82054 Phone: 760-901-2590 Fax: 760-901-2582 sheng_li@gg.nitto.co.jp</p>	<p>Yuankun Lin University of Toronto 10 King's College Road Toronto, Canada Phone: 416-978-8935 Fax: 416-971-3020 yuankun.lin@utoronto.ca</p>
<p>Richard Lytel Sun Microsystems 9525 Towne Centre Drive, USAN10-102 San Diego, CA 92121 Phone: 858-625-5106 Fax: rick.lytel@sun.com</p>	<p>Hong Ma University of Washington 302 Roberts, Box 352120 Seattle, WA 98195 Phone: 206-616-6550 Fax: 206-543-3100 hma@u.washington.edu</p>

<p>Massimo Malagoli University of Arizona Chemistry Department 1306 E University Blvd. Tucson, AZ 85721-0041 Phone: 520-626-6514 Fax: 520+621+8407 malagoi@u.arizona.edu</p>	<p>Seth Marder University of Arizona PO Box 210041 Tucson, AZ 85721 Phone: 520-626-5425 Fax: 520-574-7810 smarder@u.arizona.edu</p>
<p>Ken Matsumoto Nitto Denko Technical 401 Jones Rd. Oceanside, CA 82054 Phone: 760-901-2582 Fax: kenji_matsumoto@gg.nitto.co.jp</p>	<p>Sumit Mazumdar University of Arizona Physics-Atmospheric Science 375 PO Box 210081 Tucson, AZ 85721 Phone: 520-621-6803 Fax:</p>
<p>Tom Mino Lumera Corporation 19910 North Creek Pkwy, PO Box 3008 Bothell, WA 98011 Phone: 425-398-6540 Fax: 425-398-6599 tom_mino@lumera.com</p>	<p>W.E. Moerner Stanford University Mail Code 5080, Department of Chemistry Stanford, CA 94305 Phone: 650-723-1727 Fax: 650-725-0259 wmoerner@stanford.edu</p>
<p>K "Mohan" Mohanalingam University of Arizona 9030 S. Rita Rd., Ste. 300 Tucson, AZ 85747 Phone: 520-5744-0456 Fax: 520-574-7810 mohan@u.arizona.edu</p>	<p>Leonel Murga University of Arizona Chemistry Department Tucson, AZ 85721 Phone: 520-626-6514 Fax: lmurga@u.arizona.edu</p>
<p>Koichiro Nakamura Nippon Sheet Glass Co., LTD 1 Kaidoshita, Konoike Itami, Japan Phone: +81-727-81-0081 Fax: +81-727-79-6906 koichironakamura@mail.ngs.co.jp</p>	<p>Volodymyr Nesterov New Mexico Highlands University Department of Chemistry Las Vegas, NM 87701 Phone: 505-454-3208 Fax: 505-454-3103 volodya@kremlin.nmhu.edu</p>
<p>Vladimir Nesterov New Mexico Highlands University Department of Chemistry Las Vegas, NM 87701 Phone: 505-454-3464 Fax: 505-454-3103 vlad@kremlin.nmhu.edu</p>	<p>Indunil Nishantha University of Arizona PO Box 210041 Tucson, AZ 85721 Phone: 520-621-6335 Fax: nishanth@email.arizona.edu</p>

<p>Yuichiro Ogata Hokkaido University Division of Biological Sciences Saporoi 606-0810, Japan Phone: +81-11-706-2775 Fax: +81-11-706-4909 yogata@sci.hokudai.ac.jp</p>	<p>Koji Ohta National Institute of Advanced Industrial Science and Technology 1-8-31 Midorigoaka Ikeda, Osaka 563-8577, Japan Phone: +81-727-51-9523 Fax: +81-727-51-9637 k.ohta@aist.go.jp</p>
<p>Akira Otomo Kansai Avanced Research Center 588-2 Iwaoka, Nishi-KV Kobe, Japan Phone: +81-78-969-2255 Fax: +81-78-969-2259 akira_o@crl.go.jp</p>	<p>Giorgio Pagani University of Milano-Bicocca Materials Science Department, Viacozzi 53 20125 Milano, Italy Phone: +39-26-448-5228 Fax: +39-26-448-5403 giorgio.pagani@mater.unimib.it</p>
<p>Tim Parker Lumera Corporation 19910 Norht Creek Pkwy, PO Box 3008 Bothell, WA 98011 Phone: 425-398-6526 Fax: 425-398-6599 timothy_parker@lumera.com</p>	<p>Danilo Pedron University of Padova Dept. Physical Chemistry, Via Loredan 2 Padova 35131, Italy Phone: +39-049-827-5148 Fax: +39-049-827-5135 d.pedron@chfi.unipd.it</p>
<p>Joseph Perry University of Arizona 9030 S. Rita Rd., Ste. 300 Tucson, AZ 85747 Phone: 520-574-0456x10 Fax: 520-574-7810 jwperry@u.arizona.edu</p>	<p>André Persoons University of Leuven Celestijnenlaan, 200 D B-3001 Leuven, Belgium Phone: +32-15-32-7197 Fax: +32-16-32-7982 andre.persoons@fys.kuleuven.ac.be</p>
<p>Nasser Peyghambarian University of Arizona Optical Sciences, PO Box 210094 Tucson, AZ 85721 Phone: 520-621-4649 Fax: nnp@u.arizona.edu</p>	<p>Stephanie Pond University of Arizona 9030 S. Rita Rd., Ste. 300 Tucson, AZ 85747 Phone: 520-574-0456 x 16 Fax: 520-574-7810 sjpond@u.arizona.edu</p>
<p>Margie Preble University of Arizona 1630 E University Blvd., Box 910094 Tucson, AZ 85721 Phone: 520-621-5788 Fax: 520-626-6219 mpreble@optics.arizona.edu</p>	<p>Michael Proctor University of Arizona 1401 E University Blvd. Tucson, AZ 85704 Phone: 520-621-4008 Fax: 520-621-6259 mproctor@arizona.edu</p>

	<p>Raul Rangel-Rojo CICESE Optics Department, Km. 107 Carretera Tijuana-Ensenada Ensenada, B.C. 22860, Mexico Phone: +52-6-1744501 Fax: +52-6-17450553 rrangel@cicese.mx</p>
<p>Stephen Rankin National Reconnaissance Office 14675 Lee Rd. Chantilly, VA 20151-1715 Phone: 703-808-4825 Fax: 703-808-2646 srankin@erols.com</p>	<p>Bum ku Rhee Sogang University CPO Box 1142 Seoul 100-611, Korea Phone: +82-2-705-8433 Fax: +82-2-3273-1547 brhee@ccs.sogang.ac.kr</p>
<p>Chad Risko University of Arizona 1306 E University Blvd. Tucson, AZ 85721 Phone: 520-626-6514 Fax: cmrisko@email.arizona.edu</p>	<p>Vincent Rodriguez University of Bordeaux I 351, Cours de la liberation 33405 Talendedex, France Phone: +33-0-556-846351 Fax: +33-0-556-848-402 vincent@morgane.lsmc.u-bordeaux.fr</p>
<p>Mariacristina Rumi University of Arizona 9030 S. Rita Rd., Ste. 300 Tucson, AZ 85747 Phone: 520-574-0456 x17 Fax: 520-574-7810 rumim@u.arizona.edu</p>	<p>Ted Sargent University of Toronto ECE, 10 King's College Rd. Toronto, M5S 3G4, Canada Phone: 416-946-5051 Fax: 416-971-3020 ted.sargent@utoronto.ca</p>
<p>Hiroyuki Sasabe Chitose Institute of Science and Technology 758-65 Bibi Chitose, Kokkaido 066-8655, Japan Phone: +81-123-27-6109 Fax: sasabeh@photon.chitose.ac.jp</p>	<p>Markus Schmidt Technische Universitat Hamburg- Harburg Raum 313 21073 Hamburg Germany Phone: +49-040-42878-3309 Fax: +49-040-42878-2229 markus.schmidt@tu-harburg.de</p>
<p>Johanna Schmidtke University of Arizona PO Box 210041 Tucson, AZ 85721 Phone: 520-574-0456 Fax: 520-574-7810 johanna@u.arizona.edu</p>	<p>Bill Schneider DARPA 3701 North Fairfax Dr. Arlington, VA 22203-1714 Phone: 703-696-2251 Fax: 703-696-2206 wschneider@darpa.mil</p>

<p>Gregory Schöles University of Toronto 80 St. George St. Toronto M5S 346, Canada Phone: 416-946-7532 Fax: 416-978+8775 gscholes@chem.utoronto.ca</p>	<p>Zouheir Sekkat Osaka University Osaka 656-0871, Japan Phone: +81-06-6879-4186 Fax: +81-06-6879-7330</p>
<p>Vladimir Serikov Nippon Sheet Glass Co., LTD 4035 Paseo De La Vista Bonita, CA 91902 Phone: 619-829-7072 Fax: 619-472-9845 vladimirserikov@mail.nsg.co.jp</p>	<p>Raffaella Signorini University of Padova Via Lorendan 2 Padova 35131, Italy Phone: +39-049-8275058 Fax: +39-049-8275135 r.signorini@chfi.unipd.it</p>
<p>Michael Sims Montana State University Department of Chemistry, 108 Gaines Bozeman, MT 59717 Phone: 406-994-7270 Fax: 406-994-5407 mksims76@hotmail.com</p>	<p>Kenneth Singer Case Western Reserve University Adelber Hall Room 4 Cleveland, OH 44106-7015 Phone: Fax: kds4@po.cwru.edu</p>
<p>Sonja Sioncke K.U. Leuven Celestijnenlaan, 200 D Leuven 3001, Belgium Phone: +32-16-32-7169 Fax: +32-16-32-79-82 sonja.sioncke@fys.kuleuven.ac.be</p>	<p>Jiwon Sohn Seoul National University San 56-1, Shillim-dong, Kwanak-gu Seoul, Korea Phone: +82-2-880-7479 Fax: +82-2-886-8331 jiwon07@snu.ac.kr</p>
<p>Silvia Soria Laser Laboratorium Goettingen e.v. Hans-Adolf-Drebs-Weg 1, D-37077 Gottingen, Germany Phone: +49-551-5035-43 Fax: +49-551-5035-99 ssoria@llg.gwdg.de</p>	<p>Charles Spangler Montana State University Department of Chemistry, 108 Gaines Bozeman, MT 59717 Phone: 406-994-3932 Fax: 406-994-5407 uchcs@earth.oscs.montana.edu</p>
<p>George Stegeman University of Central Florida 4000 Central Florida Blvd. Orlando, FL 32816 Phone: 407-823-6915 Fax: 407-823-6955 george@creol.ucf.edu</p>	<p>Francesco Stellacci University of Arizona 9030 S. Rita Rd., Ste. 300 Tucson, AZ 85747 Phone: 520-574-0456 x 15 Fax: 520-574-7810 frstella@u.arizona.edu</p>

<p>Zhiyong Suo Montana State University Department of Chemistry, 108 Gaines Bozeman, MT 59717 Phone: 406-994-6717 Fax: 406-994-5407 suozy@yahoo.com</p>	<p>Carlo Taliani ISM-CNR Via P. Gobetti 101 Bologna, Italy Phone: +39-051-6398531 Fax: +39-051-6398539 c.taliani@ism.bo.cnr.it</p>
<p>Scott Tarter Montana State University Department of Chemistry, 108 Gaines Bozeman, MT 59717 Phone: 406-994-6717 Fax: 406-994-5407 tarter@bigsky.net</p>	<p>Tatiana Timofeeva New Mexico Highlands University Department of Chemistry Las Vegas, NM 87701 Phone: 505-454-5362 Fax: 505-454-3103 t_timofeeva@yahoo.com</p>
<p>Kenro Totani 2-24-16 Nakamachi 184-0012 Koganei, Japan Phone: +81-423-88-7289 Fax: +81-423-88-7289 kenyant@cc.tuat.ac.jp</p>	<p>Takuya Tsukagoshi Stanford University 420 Via Palou CIS-X #B113-44 Stanford, CA 94305-4075 Phone: 650-725-3301 Fax: takuya@kaos.stanford.edu</p>
<p>Neil Tucker University of Arizona PO Box 210041 Tucson, AZ 85721 Phone: 520-574-0456 Fax: 520-574-7810 nmtucker@u.arizona.edu</p>	<p>Robert Twieg Kent State University Department of Chemistry Kent, OH 44242 Phone: 330-672-2791 Fax: 330-672-3816 rtwieg@lci.kent.edu</p>
<p>Eric Van Stryland University of Central Florida 4000 Central Florida Blvd. Orlando, FL 32816 Phone: 406-823-6835 Fax: 407-823-6880 evanstry@mail.ucf.edu</p>	<p>Valy Vardeny University of Utah Department of Physics Salt Lake City, UT 84112 Phone: 801-581-8072 Fax: 801-581-4801 val@mail.physics.utah.edu</p>
<p>Ignacio Vargas-Baca McMaster University Department of Chemistry 1280 Main Street, West Hamilton, Ontario, Canada L8S 4M1 Phone: 905-525-9140 xz 23497 Fax: 905-522-2509 vargas@chemistry.mcmaster.ca</p>	<p>Tatsuo Wada RIKEN 2-1 Hirosawa, Wako, Wako 351-0198, Japan Phone: +81-48-467-9378 Fax: +81-48-462-4647 tatsuow@postman.rik.en.go.jp</p>

<p>Jing Wang University of Arizona Chemistry Department Tucson, AZ 85721 Phone: 520-621-8674 Fax: jingw@email.arizona.edu</p>	<p>Peng Wang Nitto Denko Technical 401 Jones Rd. Oceanside, CA 92054 Phone: 760-907-2620 Fax: 760-901-2582 pswang@ucsd.edu</p>
<p>Toshiyuki Watanabe Tokyo University of Agriculture & Tech. Dept. of Applied Chemistry 2-24-16 Nakamachi, Koganei-shi Tokyo 184-8588 Japan Phone: +81-423-88-7289 Fax: +81-423-88-7289 toshi@cc.tuat.ac.jp</p>	
<p>Watt Webb Cornell University Applied & Engineering Physics 223 Clark Hall Ithaca, NY 14853-2501 Phone: 607-255-3331 Fax: 607-255-7658 www2@cornell.edu</p>	<p>Wim Wenseleers Universiteit Antwerpen (UIA) Departement Natuurkunde Universiteitsplein 1 B-2610 Antwerpen, (Wilrijk) Belgium Phone: Fax: Wim.Wenseleers@ua.ac.be</p>
<p>Rüdiger Wortmann Universitaet Kaiserslautern Department of Chemistry, PO Box 3049 Kaiserslauteriv, Germany 67653 Phone: +49-631-205-2537 Fax: +49-631-205-2750 rwortman@rhrk.uni-kl.de</p>	<p>Kurt Wostyn K.U. Leuven Celestijnenlaan, 200 D Leuven 3001, Belgium Phone: +32-16-39-7523 Fax: +32-16-39-7982 kurt.wostyn@fys.kuleuven.ac.be</p>
<p>Michiharu Yamamoto Nitto Denko Technical 401 Jones Rd. Oceanside, CA 92054 Phone: 760-901-2386 Fax: michiharu_yamamoto@gg.nitto.co.jp</p>	<p>Wenhui Zhou University of Arizona PO Box 210041 Tucson, AZ 85721 Phone: 520-5740456 Fax: 520-574-7810 wenhui@u.arizona.edu</p>
<p>Guido Zuccarello Booz Allen Hamilton 4001 Fairfax Drive, Suite 750 Arlington, VA 22203 Phone: 703-465-5285 Fax: zuccarello_guido@bah.com</p>	<p>Takashi Fujihara Keio University Faculty of Science & Technology 3-14-1 Hiyoshi Kohoku Yokohama Kanagawa 223-8552 Japan Phone: +81-45-563-1151 x 42222 Fax: +81-45-561-8838 fuji@ume.elec.keio.ac.jp</p>

Final Schedule ICONO'6

Sunday 16 Dec 2001	Monday 17 Dec 2001	Tuesday 18 Dec 2001	Wednesday 19 Dec 2001	Thursday 20 Dec 2001
	7:15 – 8:15 Breakfast 8:15 – 8:30	7:15 – 8:30 Breakfast	7:15 – 8:30 Breakfast	7:15 – 8:30 Breakfast
	Welcome -- Seth Marder			
	8:30 – 10:10 EO Materials & Devices I Session Chair – C. Lee Alex K. Y. Jen Giorgio Paganini Susan Ermer François Kajzar	8:30 – 10:10 EO Materials & Devices II Session Chair – G. Stegeman Isabelle Ledoux Eunkyoung Kim Rick Lytel	8:30 – 10:10 Nano & Bio-Photonics I Session Chair – B. Kippelen Watt W. Webb Mireille Blanchard-Desce Charles Spangler Koen Clays	8:30 – 10:10 Nano & Bio-Photonics II Session Chair – A. Persoons Wolfgang Knoll Rüdiger Wortmann Guglielmo Lanzani Markus Schmidt
	10:40 – 12:00 Photo-Refractives Session Chair – Hiro Sasabe W.E. Moerner Bernard Kippelen Kenneth D. Singer	10:30 – 11:50 Studies of Conjugated Materials II Session Chair – Joe Perry Eric Van Straylight Toshiyuki Watanabe Zonheir Sekkat	10:40 – 12:10 Materials & Devices II Session Chair – Nasser Peyghambarian David Beljonne Toshikuni Kaino Peter Günter	10:40 – 11:40 Organic Electronics II Session Chair – Paul Armistead Zhenan Bao Carlo Taliani
	12:00 – 1:30 Lunch 1:30 4:30 Free time -- on your own	12:00 – 1:30 Lunch 12:00 – 4:30 Excursion: Arizona-Sonora Desert Museum (box lunch provided)	12:00 – 1:30 Lunch 12:45 – 4:30 Free time -- on your own	11:40 Closing Remarks Seth Marder
3:00 – 6:00 p.m. Registration	4:30 – 6:10 Studies of Conjugated Materials Session Chair – Jean-Luc Brédas Z. Valy Vardeny Satoshi Kawata Ted Sargent Theodore Goodson III Mark Kuzyk	4:30 – 5:30 Free time -- on your own	4:30 – 6:10 Organic Electronics I Session Chair – Neal Armstrong Yasuhiko Shirota Robert Twieg Francesco Stellacci	
6:30 p.m. BBQ Dinner at Loews Ventana Canyon Resort	6:10 – 7:30 Poster Session I Posters must be up by 3:00 p.m.	5:30 – 7:00 Poster Session II	7:00 Pre-Banquet Reception	
		7:15 Excursion: Pinnacle Peak Restaurant	8:00 – 10:30 Conference Banquet	